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Geology of Madoc and North Huntingdon Townships

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ONTARIO DEPARTMENT OF MINES

GEOLOGICAL BRANCH

OPEN FILE REPORT

No 5000

GEOLOGY OF MADOC

AND

NORTH HUNTINGDON TOWNSHIPS

MARCH 1, 1967

GEOLOGY OF MADOC

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NORTH HUNTINGDON TOWNSHIPS

BY

D. F. HEWITT

Project 64-14

Table of Contents

Illustrations *

* Illustrations are located at the rear of this report

Abstract

This report describes the geology and structure of Madoc township and the northern seven concessions of Huntingdon township, Hastings County, an area of 156 square miles. Madoc has been a centre of mining activity in eastern Ontario for over 100 years with production of iron, gold, copper, pyrite, fluorspar, talc, slate and marble. At the present time talc and marble are the principal mineral products.

Physiographically the area is divided into two parts by the Paleozoic - Precambrian contact which runs along the south side of Moira Lake. The area to the south of Moira Lake is largely underlain by Ordovician limestone and outliers of this limestone are common in all of Madoc township. The oldest Precambrian rocks are the Tudor volcanics, a series of dark green basic lavas, lying in the eastern and northern parts of Madoc township. In the northern part of the township the Tudor volcanics are overlain by grey-blue, fine-grained marble. In the southeastern and central part of the township the basic volcanics are overlain by conglomerate, argillite, pelitic and psammo-pelitic schists. Near Queensborough the period of basic volcanism closed with acid volcanism and an acid volcanic centre is present.

In the south central part of Madoc township north and west of Madoc village the Madoc volcanics occupy a domical area of about nine square miles. These volcanics range from andesite to rhyolite.

Intruding the volcanics and metasediments are four main bodies of pink granite and syenite: The Deloro granite, the Moira granite, the Gawley Creek syenite and the Mount Moriah syenite.

The rocks are folded and faulted, the principal folds being the northwest - trending Queensborough syncline and the northeast - trending Madoc syncline. The principal faulting strikes northwest - southeast and some of these fault systems are occupied by fissure-filling fluorspar veins.

Geology of Madoc and Northern Huntingdon Townships

By

D. F. Hewitt[1]

Introduction

This report describes the geology and structure of Madoc township and the northern seven concessions of Huntingdon township (concessions VIII to XIV), Hastings county, an area of 156 square miles. These townships are covered by the Tweed, Campbellford, Kaladar and Bannockburn National Topographic sheets. Madoc is the principal town of the area which also includes the villages and settlements of Crookston, Eldorado, Empey, Keller Bridge, Bannockburn, ~~Copper~~ Cooper, Rimington and Hazzards Corners. Highway No. 7 crosses Madoc township from east to west and highway No. 62 crosses the township from north to south. All parts of the area are easily accessible by road.

Prospecting and Mining Activity

Madoc has been a centre of mining activity in eastern Ontario for over 100 years. In 1837 Uriah Seymour erected a furnace for smelting iron ore and opened the Seymour iron mine which operated from 1837 to 1845. Both hematite and magnetite ores were mined in the Madoc area and iron mines operated intermittently from 1837 to about 1910. Among the active iron mines in Madoc township were the McKenty which produced hematite as early as 1877, the Miller, St. Charles, Brennan, Wallbridge, Dufferin, 49 Acre, Sexsmith, Cook, Coe, Cameron, Nelson, Fox, Knob and Dominion mines. There was renewed interest in iron deposits in the 1950's

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when several properties were drilled. In 1964 some work was done on the Dufferin mine near Malone.

In 1866 the first discovery of gold in Ontario was made at the Richardson mine near Eldorado. An interesting account of the ensuking "gold rush" is given by Gibson (1937, p. 3). The Bannockburn gold mine operated from 1894 to 1898 and the Sophia or Diamond gold mine from 1896 to 1901. The only lead mine in Madoc township was the Hollandia mine which operated from 1898 to 1906. The Eldorado copper mine produced from 1903 to 1907 and a copper smelter was opened at Eldorado at that time. Pyrite mining began in Madoc township in 1901 with the opening of the Bannockburn pyrite mine which finally closed in 1919. The Queensboro or Blakely pyrite mine operated from 1905 to 1908 and the Canadian Sulphur Ore Company mine from 1906 to 1919.

Flourspar mining began at Madoc in 1905 and a total of over 150,000 tons of flourspar has been mined. The main periods of activity were 1916-20 and 1940-51. Thirty-one fluorspar mines have been opened in the map area. Talc was discovered in the Madoc area in 1896 and talc has been produced continuously since that time with a total production of about 700,000 tons valued at $7,800,000. The principal producer has been Canada Talc Industries Limited and its predecessors.

Although marble was quarried at Madoc as early as 1900, it was not until 1936 that a permanent marble chip industry was established. Since that time marble production has increased until in 1964 four companies, operating about 20 marble quarries, were active in the Madoc area producing marble chips for the

terrazzo industry. In 1964 marble production in the Madoc area amounted to about $300,000.

Slate was quarried at Madoc in 1932 to 1937. Between 1940 and 1956 Building Products Limited operated 5 stone quarries in granite and rhyolite for the production of roofing granules. Paleozoic limestone is quarried for road stone on No. 62 highway near Eldorado. Several sand and gravel pits operate intermittently in Madoc township.

Present Geological Survey

The geological survey of Madoc and north Huntingdon townships was carried out during parts of the summers of 1964 and 1966. In 1964 the author was ably assisted by Reg Tivy of Coe Hill, Geological mapping was done in July and August, 1966, by E. C. Appleyard and G. R. Guillet. E. C. Appleyard was assisted by M. Shaw. Plotting of geological data was done on perfatrace fitted over aerial photographs on the scale of 1 inch to 1320 feet. Additional geological data was obtained from the maps of M. E. Wilson (1939), A. K. Saha (1957) and Ian Bain (1960).

Previous Geological Work

The earliest geological map of the area was that of Eugene Coste and James White published in 1889 by the Geological Survey of Canada. It is entitled "Geological and Topographical Map of the Madoc and Marmora Mining District", and is very useful as it locates many of the early iron mines in the area, including several not mentioned in the literature. In 1914, Miller and Knight (1914) published a report entitled "The Precambrian Geology of Southeastern Ontario". Maps of portions of the Madoc, Hazzards Corners and Queensboro areas

are included. Considerable information is given on mining properties active in the area at that time. This is the most comprehensive report available on the area. From 1920 to 1925 M. E. Wilson mapped the Madoc and Marmora sheets (maps 559A and 560A) for the Geological Survey of Canada. These sheets were published in 1939 and are the most up-to-date and useful geological maps available for the southern part of Madoc and northern Huntingdon townships. They are on the scale of one mile to one inch. No report was published to accompany these sheets but Wilson described the talc and fluorspar deposits of the area in separate volumes on these commodities, Wilson (1926, 1929). In 1930, Osborne (1930) described the "Non-Metallic Mineral Resources of Hastings County".

Aeromagnetic sheets are available on the scale of one mile to the inch for the Bannockburn, Kaladar and Campbellford topographic sheets. The Deloro granite pluton was studied by A. K. Saha (1959). The southeastern corner of Madoc township was mapped and described by Ian Bain (1960).

Reports on various commodities describe properties in Madoc and Huntingdon townships. Several of these reports are listed below:

Guillet, G. R., 1964: Fluorspar in Ontario; Ont. Dept. of Mines, Industrial Mineral Report No. 12.

Hewitt, D. F., 1964: Building Stones of Ontario, Part III, Marble; Ont. Dept. of Mines, Industrial Mineral Report No. 16.

Rose, E. R., 1958: Iron Deposits of Eastern Ontario and adjoining Quebec; Geol. Surv. Canada, Bulletin 45.

Spence, H. S., 1940: Talc, Steatite and Soapstone; Pyrophyllite; Can. Dept. Mines & Resources, Mines Branch Report No. 803.

Wilson, A. W. G., 1912: Pyrites in Canada, Can. Dept. of Mines, Report No. 167.

Wilson, M. E., 1926: Talc Deposits of Canada, Geol. Surv. Canada, Econ. Geol. Series No. 2.

Wilson, M. E. 1929: Fluorspar Deposits of Canada, Geol. Surv. Canada, Econ. Geol. Series No. 6.

Physiography

Physiographically the area is divided into two parts by the Paleozoic - Precambrian contact which runs along the south side of Moira Lake. The area to the north of Moira Lake forms part of the Precambrian peneplane which slopes gently southward from an average elevation of about 900 feet north of Bannockburn to 600 feet in the vicinity of Madoc. The portion south of Moira Lake is underlain by flat-lying Paleozoic limestone of the Lake Ontario homocline.

The northwestern corner of Madoc township is a rough rocky upland underlain by the Gawley Creek syenite. The highest point in the township is a hill of this syenite with an elevation of 1050 feet. Relief in the township rarely exceeds 200 feet. The western part of Madoc township between No. 7 highway and the railway is a rocky highland area ~~underlain~~ formed by knobby granite hills of the Deloro granite stock. These are known as the "Huckleberry

Rocks". Flat-lying Paleozoic outliers are common in the northern part of Madoc township. The largest of these outliers is in the northeastern part of Madoc township at Copper where there is an extensive area of good farmland on the flat outlier.

The area is drained by the Moira and Black rivers and their tributaries which flow into Lake Ontario. The main body of water is Moira Lake which is three miles long and a mile wide. Its south shore is a Paleozoic limestone scarp which marks the north edge of the Lake Ontario homocline and the ~~beginning~~ south edge of the Precambrian Shield.

General Geology

The map area straddles the Paleozoic - Precambrian contact. The area to the south of Moira Lake is largely underlain by Ordovician limestone. Outliers of Ordovician limestone are common in Madoc township north of Moira Lake. The oldest Precambrian rocks are the Tudor volcanics, a series of dark green basic lavas, lying in the eastern and northern parts of Madoc township. In the northern part of the township, the Tudor volcanics are overlain by grey-blue fine grained marble of the Hastings type. There is a transition from volcanism to sedimentation, with some volcanic bands being found within the marble sequence. In the southeastern part of the township the basic volcanics are overlain by conglomerate, argillite, pelitic and psammo-pelitic schists. At Queensborough, the period of basic volcanism closed with acid volcanism. An acid volcanic

centre is present a mile or so south of Queensborough in the trough of the Queensborough syncline. Rhyolite is associated with pyritiferous black slates and massive sulphides. Felsite and acid tuffs are found in the volcanic assemblage.

In the south central part of Madoc township northwest of Madoc village the Madoc volcanics occupy a domical area of about nine square miles. These volcanics range from andesite to rhyolite. The andesite is overlain along the southeast side by conglomerate and slate. The rhyolite in part cuts and intrudes the marble. Apparently volcanism and sedimentation were concomitant in the area and there is no widespread erosional unconformity between the volcanics and the sediments. Although the marble is chiefly of the grey-blue, fine-grained, well-bedded Hastings type some medium crystalline white, buff, pink, green and black dolomitic and calcitic marbles are also found.

Intruding the volcanics and sediments are four main bodies of pink granite and syenite. These are the Deloro granite which forms a stock of pink medium-grained granite in west central Madoc and adjacent Marmora townships; the Moira granite, a pink medium to coarse-grained granite outcropping on the south and northeast shores of Moira Lake; the Gawley Creek syenite, a coarse-grained pink biotite syenite occupying the northwestern part of Madoc township; and the Mount Moriah syenite, a pink coarse-grained biotite syenite, which just extends into the northeast corner of Madoc township. Minor intrusions of gabbro and diorite are found.

The rocks are folded, the principal folds being the northwest-trending Queensborough syncline and the northeast-trending

Madoc syncline.

Table of Formations

CENOZOIC

PLEISTOCENE: Till, sand, gravel, clay, marl.

UNCONFORMITY

PALEOZOIC

ORDOVICIAN: Black River limestone

UNCONFORMITY

PRECAMBRIAN

PLUTONIC ROCKS:

Granite, syenite, diorite, gabbro.

INTRUSIVE CONTACT

METASEDIMENTARY AND VOLCANIC ROCKS

Marble;

Conglomerate, pelitic and psammo-pelitic rocks, quartzite;

Acid and basic volcanic rocks.

Tudor Volcanics

A belt of basic volcanic rocks extends southward into Madoc township from Tudor township. These have been named by Lumbers the "Tudor volcanics". The band extends down the east side of Madoc township to concession I where it swings west-ward around the axis of the Queensborough syncline. The basic volcanic band terminates in concession VIII, possibly due to faulting. The band is about $1\frac{1}{2}$ miles wide. To the east the volcanic band is intruded by the Elzevir granite. To the west the volcanic band is overlain by metasedimentary rocks, chiefly marble.

The volcanics are green-weathering, dark coloured andesite. They belong to the greenschist facies. Thin sections indicate

the rocks are composed principally of hornblende and plagioclase with some chlorite and carbonate. Talc and actinolite are developed as hydrothermal alteration products in some places.

Madoc Volcanics

The Madoc volcanics occupy an area of approximately nine square miles in the south-central part of Madoc township. They outcrop on No. 62 highway from lot 5 to lot 10 and along No. 7 highway in concessions II, III and IV. The volcanics range in composition from andesite to rhyolite and are predominantly black, grey-green or pink in colour. Massive lava, pillowed lava, vesicular and amygdaloidal lava, tuff and agglomerate are common facies of these volcanics.

A specimen of massive, fine-grained black andesite from lot 6, concession V, Madoc township was examined in thin section. It is a very fresh andesite composed of elongate laths of hornblende and finely intergrown andesine feldspar. Abundant small opaque grains contribute to the black colour. Minor quantities of epidote and carbonate are present. A partial chemical analysis of the andesite gives silica 48.96 percent, soda 3.37 percent, and potash 1.00 percent. The specific gravity is 3.03.

Miller and Knight (1914, p. 64) give two analyses of the Madoc andesite as follows:

	(1)	(2)
SiO_2	60.34	54.44
Al_2O_3	15.01	17.63
Fe_2O_3	3.71	7.18
FeO	10.57	6.12
CaO	1.05	2.83
MgO	0.05	3.19
Na_2O	2.72	4.03
K_2O	3.23	1.49
H_2O	1.22	2.04
CO_2	2.57	1.64
Totals	100.47	100.59

The Madoc andesite is much fresher than the Tudor basic volcanics which occupy the eastern part of the township.

The andesite shows vesicular structure along both sides of highway No. 62 in lots 6 and 7. In lot 7, concession VI, on the east side of the highway, there is an excellent exposure of agglomerate. Fragments of vesicular andesite, tuff, greenstone, pink felsite, rhyolite and aplite, ranging in size from about one inch to 18 inches, occur in a grey-green andesitic to dacitic matrix. There are good exposures of agglomerate in concession II south of No. 7 highway.

There is a small outlier of grey-green agglomeratic lava forming a hill on the north side of Madoc village. This agglomerate is described by Miller and Knight (1914, p. 65).

The occurrence was first described by Logan (1863, p. 32-33) as conglomerate.

In lots 8, 9 and 10, concession V and VI, the black andesite grades into black to pink rhyolite and trachyte. A specimen of mottled pink and black lava from a roadcut on the highway on lot 9, concession V was examined under the microscope. It consists of a fine-grained intergrowth of feldspar laths, principally oligoclase, with some microcline. There are phenocrysts of microcline and oligoclase. The black colour is due to finely disseminated hornblende and opaque minerals. Minor carbonate is present. The rock is thought to be a ~~latite~~ trachyte. A partial chemical analysis indicates 56.25 percent silica, 4.58 percent soda and 7.23 percent potash. The specific gravity is 2.75.

Pink rhyolitic lava from lot 10, concession V, is composed of a fine aggregate of quartz and feldspar with minor carbonate and opaques. A partial chemical analysis indicates 65.03 percent silica, 1.42 percent soda and 10.79 percent potash. The specific gravity is 2.60.

A "black rhyolite" quarry was operated by Building Products Limited on the west half of lot 10, concession V, Madoc township. A thin section of this rock is composed of a fine aggregate of quartz and feldspar with fine hornblende and abundant finely disseminated fine-grained opaque minerals. Minor carbonate is present. Oligoclase phenocrysts are present in the rock. A partial chemical analysis indicates a silica content of 63.69 percent; soda 5.15 percent and potash 2.81 percent.

Queensborough Acid Volcanic Centre

Lying above the Tudor volcanics in the trough of the Queensborough syncline are a series of rhyolite and felsite volcanics which form part of an acid volcanic centre in the vicinity of the Canadian Sulphur pyrite mine.

The rhyolite, which is dense aphanitic light grey rock, has been quarried for roofing granules on lot 9, concession X. The felsite ~~which~~ outcrops north and south of Hazzard Lake. It is a fine-grained buff coloured rock composed of angular quartz and feldspar, rhyolite fragments and some carbonate. It is an acid volcanic fragmental intrusive rock which cuts the marble.

The rhyolite, felsite, pyrite ore bodies and pyritiferous black slates are all typical associated rocks of the acid volcanic centre.

Conglomerate, Slate, Argillite, Pelitic Schist

Conglomerate bands which lie in part above the basic volcanics and below the marbles have been referred to the Hastings series by Miller & Knight (1914) and Wilson (1939, map 559A). The conglomerates in southeastern Madoc township have been recently studied by Bain (1960). He calls them the Skootamatta conglomerate. He notes that this conglomerate is mingled with the basic volcanics in two places and states that no evidence of unconformity was found to suggest that the volcanics were peneplaned before the conglomerate was formed.

An extensive band of conglomerate extends across lots 2 and 3, concessions IX and X. It rests on basic volcanics to the north and is intruded by diabase to the south. Pebbles are mainly black, red and grey quartzite in a matrix of biotite schist. Some conglomerate is present in lot 1, concessions X and XI to the south. It appears to be a faulted remnant in marble. Another area of conglomerate is present in lot 3, concession IX, north of No. 7 highway. The pebbles are quartzite, marble, schist and chert in a matrix which grades from schist to quartzite.

A conglomerate band resting on Madoc andesite extends across lots 4, 5 and 6, concessions V and VI, Madoc township. The conglomerate is composed chiefly of marble and quartzite pebbles. This conglomerate is overlain by slate which forms a band extending around the nose of the Madoc syncline. The slate was quarried in lot 2, concession V and lot 5, concession VI. Slate is interbanded in places with the conglomerate.

At the time of Miller and Knight's report on the Madoc area (1914) the origin of this conglomerate band was in dispute. There was a question of whether the conglomerate were a true conglomerate or a conglomerate of autoclastic origin Miller and Knight 1914, p. 60-61). Also the relation of the conglomerate to the underlying andesite was in dispute. Some observers thought the contact was an unconformity while others considered that the andesite intruded the conglomerate.

A band of conglomerate is present at Hazzards Corners in lot 12, concession VIII. The pebbles consist of marble, felsite,

quartz, chert and rare porphyry. Overlying the conglomerate is a band of buff - coloured, fine-grained felsite which resembles quartzite. The conglomerate rests on pelitic schist which is underlain by marble.

The principal slate band in Madoc township forms a wide band extending down the north side and around the nose of the Madoc Syncline. The slate is a very fine-grained olive drab-coloured rock with good slaty cleavage. At the quarry in lot 5, concession VI, pebble bands may be seen in the slate.

Miller and Knight (1914, p. 69) give three analyses of the slate:

	1	2	3
SiO_2	56.40	52.92	53.90
Al_2O_3	17.80	16.69	20.71
Fe_2O_3	7.52	9.75	8.31
FeO	1.53		
CaO	3.67	4.36	3.15
MgO	3.45	2.38	0.34
Na_2O	0.75	0.80	0.76
K_2O	4.38	5.36	5.83
H_2O	4.42	7.32	6.88
CO_2	trace		
Total	99.92	99.58	99.88

1. Old slate quarry, northwest corner, lot 5, concession VI, Madoc township.
2. North part of lot 2, concession VI, Madoc township, near boundary of lot.
3. North part of lot 2, concession VI, Madoc township, near boundary of lot.

Black and grey pyritiferous slates are associated with the rocks at the Canadian Ore Sulphur mine and the Bannockburn pyrite mine.

Argillite and pelitic schist and gneiss make up the bulk of the sediments of this group. The largest area of these rocks outcrops in the vicinity of Bannockburn village where paragneiss predominates. Dark-coloured, fine-grained argillite and greywacke are common in the southern part of Madoc township. Miller and Knight (1914, p. 70) give an analysis of altered greywacke which occurs two or three hundred yards southwest of the Presbyterian church as follows:

SiO_2	70.52
Al_2O_3	16.73
Fe_2O_3	0.74
FeO	1.47
CaO	1.47
MgO	0.05
Na_2O	0.93
K_2O	4.27
H_2O	1.62
CO_2	1.90
Total	99.70

Garnet schist occurs in the vicinity of the Canadian Sulphur Ore Company pyrite mine and the Blakely pyrite mine. Garnets are up to 1/2 inch in size, set in a fine grained matrix of quartz, feldspar and biotite with accessory pyrite, magnetite, chlorite and sericite. A chemical analysis of the garnet from near

Queensboro given by Miller & Knight (1914, p. 91) indicates that it is almandite:

SiO_2	46.06
Fe_2O_3	8.18
FeO	17.75
MnO	0.24
CaO	3.84
MgO	1.05
Al_2O_3	22.62
Total	99.74

Marble

There are extensive deposits of calcitic and dolomitic marble present in Madoc township. In the northern part of the township in the Queensborough syncline blue-grey well-bedded marble of the Hastings type predominates. In other areas there are large deposits of white, buff, green, black and pink marble many of which are operated for the production of terrazzo chips. The marble deposits of Madoc township are described by Hewitt (1964).

Deloro Granite

The half-moon shaped Deloro pluton has a length of six miles and a width of four miles. The pluton lies on the west boundary of Madoc township, with about half the intrusive body in Madoc township and half in Marmora township. There are three facies present in the pluton: the principal facies is pink medium- to coarse-grained perthite granite. Along the west border of the pluton in Marmora township there is syenite. In the east central part in an elongate area $2\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles wide northeast of Jarvis Lake in lots 8 to 13, concessions I to III, there is a body of pink fine- to medium-grained granophyric granite. This facies cuts the perthite granite.

A detailed study of the Deloro pluton has recently been made by A. K. Saha, and the reader is referred to his thesis (1957) and paper (1959) for a detailed description of the body.

The granite of the Deloro pluton is quite massive and generally lacks foliation or lineation.

Perthite Granite

The perthite granite which makes up the bulk of the pluton is a medium- to coarse-grained pink granite composed predominantly of microcline microperthite and quartz, with minor albite, chlorite, amphibole and magnetite, and accessory calcite, muscovite, sphene and zircon. Tuttle (1952, p. 116) examined sections of the Deloro (Madoc) granite and points out that perthite of this type, when composed of nearly equal amounts of albite and microline, is evidence per se of high temperature and suggests a magmatic history for the rock. Since metamorphism will promote unmixing in the alkali feldspars, it is apparent that the Deloro pluton has not suffered much regional metamorphism since emplacement.

The average modal analysis of 40 perthite granite samples from the Deloro pluton is given by Saha (1957, p. 124):

	Percent (by volume)
Quartz	27.1
Perthite	62.4
'Free' albite	5.2
Biotite + chlorite alkali amphibole	3.7
Magnetite	1.1
Calcite, muscovite, sphene, zircon, etc.	0.5

The average potash feldspar in the perthite is 49.0 percent.

Chemical analyses of the perthite granite and the granophyric granite from the Deloro pluton are given by Saha (1959, p. 1310):

	Perthite granite	Granophyric granite
SiO_2	75.45	75.88
TiO_2	0.23	0.19
Al_2O_3	11.34	11.92
Fe_2O_3	1.82	2.14
FeO	1.21	0.64
MnO	0.03	0.01
MgO	0.42	0.07
CaO	0.42	0.60
Na_2O	4.04	4.28
K_2O	4.20	4.18
P_2O_5	0.02	0.01
H_2O+	0.69	0.47
H_2O-	0.05	0.00
Totals	99.92	100.39

Modes

	Perthite granite
Quartz	31.3
Perthite	55.2
'Free' albite	8.5
Biotite	1.4
Hornblende	1.9
Calcite	0.2
Muscovite	0.3
Magnetite	1.2
Total	100.0

	Granophyric granite
Quartz	32.9
Cryptoperthitic albite	18.1
Microcline microperthite	45.0
Biotite	1.3
Chlorite	0.5
Magnetite	2.1
Total	99.9

Granophyric Granite

The granophyric granite is a fine- to medium-grained pink granite composed essentially of a graphic inter-growth of microcline microperthite and quartz. There are some phenocrysts of cryptoperthitic albite. Minor magnetite, pyrite, biotite, chlorite, zircon and fluorite is present.

The average modal analysis of seven speciments of granophyric granite is given by Saha (1957, p. 134):

	Percent by volume
Quartz	29.9
Feldspars	66.7
Biotite + chlorite	1.5
Magnetite	1.5
Muscovite + fluorite + zircon	0.5
Total	100.1

The granophyric granite was quarried for roofing granules by Building Products Limited on lot 8, concession III, Madoc township. Saha (1957) points out that compared with the perthite granite, the granophyre is less mafic, more alkaline and higher in Na_2O/K_2O ratio.

Contacts

Along the north contact the Deloro granite is in contact with grey and white marble. There is some recrystallization of the marble near the granite contacts and some development of contact metamorphic minerals such as tremolite and serpentine in concession VI. Several small magnetite deposits occur in the marble along the north contact of the pluton. The granite intrudes acid and basic lavas of the Madoc Volcanics, and inclusions of the volcanics are found in the granite. Much of the south contact of the granite in Madoc township is hidden beneath Paleozoic limestone. Many small arsenical gold deposits are clustered along the west contact of the Deloro granite in Marmora township.

W. G. Wahl (1960) has contrasted the magnetic susceptibility of the Deloro pluton with that of the Mount Moriah and Skootamatta stocks and has indicated a relationship between susceptibility and tenor of retained metals in the stocks. It is postulated that the environs of the Deloro stock is a favourable ~~locality~~ location for ore deposits.

Gawley Creek Syenite

The Gawley Creek syenite occupies the northwestern part of Madoc township. The syenite pluton is about 4 miles long in a north-south direction, and 4 miles wide in an east-west direction. It extends into Marmora township. Most of the pluton is composed of coarse-grained pink biotite-hornblende syenite similar to the Mount Moriah syenite of Grimsthorpe township. Thin section examination indicates the syenite is composed predominantly of microcline microperthite and cryptoperthitic oligoclase in large irregular sutured grains. Hornblende and biotite are varietal accessories. Minor accessories include sphene, opaques, apatite and epidote. Some oligoclase is present in several slides.

The eastern end of the syenite pluton in the vicinity of the Bannockburn gold mine is dark grey coarse-grained biotite syenodiorite composed of large crystals of oligoclase with biotite as a varietal accessory. Minor constituents include magnetite, pyrite, apatite, titanite, zoisite and calcite.

Examination of the Bannockburn aeromagnetic sheet indicates that there is a magnetic high over the Gawley Creek syenite in

the vicinity of Moss Marsh. This high has an intensity of 7500 gammas and a magnetic relief of about 5500 gammas above general level. The magnetic susceptibility of the stock is high and, in contrast to the Deloro pluton, there are few known mineral deposits surrounding it. The Moss Marsh anomaly was drilled in the 1950's and was found to be due to disseminated magnetite.

Empey Granite

A small area of coarse-grained pink granite outcrops on lot 21, concession III, Madoc township, near Empey. The granite is composed of interlocking grains of quartz, oligoclase and microcline microperthite with minor accessory fluorite, magnetite, muscovite and biotite. The granite may be related in age to the Deloro pluton.

Mount Moriah Syenite

The south edge of the Mount Moriah syenite just extends into the northeastern corner of Madoc township. The pink coarse-grained syenite is similar in lithology to the Gawley Creek syenite. The syenite is described by Meen (1944, p. 21).

Noyes Granite

On the south shore of Moira Lake in the vicinity of the Noyes fluorspar mine there are outcrops of pink medium- to coarse-grained granophyric granite composed of graphically intergrown quartz and feldspar, principally microcline and microcline

perthite. Some plagioclase is present. Minor accessories are magnetite, muscovite and zircon. This may be a part of the Moira granite.

Moira granite

The Moira granite outcrops on Stony Island in Moira Lake and for a distance of about a mile along the northeast shore of Moira Lake in the fourteenth concession of Huntingdon township. The granite area extends north from the lake for one half to three quarters of a mile and extends into Madoc and Hungerford townships.

The Moira granite is a pink albite granite composed largely of albite and quartz with minor microcline. The body is described in detail by Bain (1960), who recognized three phases: an albitite phase which makes up 90 percent of the complex; a mylonitic phase in the northeast part; and a hybrid intrusive granitic phase in the southeast part, where there is a gradation from albitite to hybrid granite rock. Bain attributes the development of the albitite to a period of soda metasomatism. The hybrid granite gneiss facies carries muscovite, tourmaline and rutile. Bain also describes an area of rhyolite porphyry one half mile long on the north shore of Moira Lake which appears to be earlier than the Moira granite complex. This area was formerly quarried for roofing granules by Building Products Limited. The porphyry is cut by black trap dikes.

~~Folding and Faulting~~

~~The two major folds in Madoc township are the Queensboro~~ syncline and the Madoc ~~syncline~~. The Queensboro syncline has its axis trending northwest about 2 ~~miles~~ west of Queensborough village. ~~The Tudor basic volcanics are folded around the nose of the syncline~~

Paleozoic Limestone

The youngest bedrock formations are the Black River limestone of Ordovician age. The basal member of the Black River limestone is frequently a reddish, greenish or chocolate brown arkose. This is often overlain by several feet of chocolate brown limestone grading from cryptocrystalline to medium crystalline in grain size. Above this the Black River formation consists of medium-grey, light grey weathering, cryptocrystalline to fine crystalline, medium to thick bedded limestone.

Some small quarries have been opened in the chocolate brown limestone for terrazzo chips and in the grey limestone for roadstone.

Pleistocene

The whole area has been glaciated. The glacial deposits consist mainly of boulder moraine and kame moraine. In the central and southern part of Madoc township, kame moraines have been opened as gravel pits.

Folding and Faulting

The two major folds in Madoc township are the Queensboro syncline and the Madoc syncline. The Queensboro syncline has its axis trending northwest about 2 miles west of Queensborough village. The Tudor basic volcanics are folded around the nose of the syncline

which pitches northwest. The nose is occupied by the Queensboro acid volcanic centre composed of felsite, rhyolite, schist, pyritiferous slate and massive pyrite lenses. The central part of the syncline is occupied by marble.

The adoc syncline lies just north of Madoc and is crossed by No. 62 highway. The axis of the syncline trends northeast. The north arm is flanked by Madoc andesite overlain by conglomerate and slate. The central part of the northeast-pitching syncline is occupied by black fine-grained marble which is quarried for terrazzo chips.

Minor folding and faulting is common in Madoc and north Huntingdon township. Widespread folding and faulting are indicated in the workings of the mines of Canada Talc Industries.

There is a prominent set of northwest-trending faults in Madoc and Huntingdon townships. All the fluorspar and barite veins of the Madoc area occupy fault fissures of post-Ordovician age. The main fault zone occupied by fluorspar veins is the Moira Lake fault zone along which the Howard, Johnston, Noyes, Perry Lake, Perry, Rogers, Kilpatrick, Keene, Bailey, McIlroy and McBeath mines occur. A further series of northwest trending faults make up the Lee-Miller group and the fault fissure veins include the Lee junior and senior, Wallbridge, Rooks, Miller, and Stewart mines. In Huntingdon township the Palmateer and Jones mines are on northwest-trending faults parallel and south of the main Moira Lake fault.

The faults show abundant fracturing and brecciation of the wall rock. The wall rock frequently shows striations and slickensides often indicating horizontal movement on the faults. Wilson (1929,

p. 46) has estimated horizontal displacement on one fault to be in the neighbourhood of 100 feet, at the Noyes mine. Horizontal striations are common along the Moira Lake fault system. Wilson states that wall rock striations on the Lee - Miller group of fluorspar veins are vertical. The age of faulting is post - Ordovician, but cannot be exactly dated due to lack of information.

ECONOMIC GEOLOGY

Barite

Barite occurs with calcite and fluorite in veins cutting the Paleozoic and Precambrian rocks. The fissure veins generally trend northwest-southeast parallel to the Moira Lake fault. Barite is a common constituent in most of the Madoc fluorspar mines. It is particularly abundant in the following three fluorspar properties which are described by Guillet (1963, p. 29-30) in "Barite in Ontario":

Huntingdon Township	
Concession XI, Lot 14, East Half	Howard or Hill property.
Concession XI, Lot 14, West Half	Johnston property.
Concession XII, Lot 13	Noyes property

Huntingdon Township

Concession XII, Lot 1

A large part of lot 1, concession XII, Huntingdon township is underlain by a Paleozoic limestone plain with very little soil cover. Several small barite veins are found cutting the limestone. The veins strike N.30°W. and dip vertically. Three of the veins examined by the writer were 3 to 6 inches wide and were composed of barite with minor fluorite and calcite.

Pit 1 consisted of an open cut 70 feet long, 1 to 3 feet wide and a maximum of 12 feet deep. A second vein is exposed in pit 2, located 50 feet east of pit 1; this pit is 400 feet long, 1 to 2 feet wide and up to 6 feet deep. A third pit 600 feet to the north is 60 feet long, 2 feet wide and 1 to 6 feet deep. The vein strikes N.38°W. and dips vertically. It is 6 inches wide.

Fluorspar

Thirty-one fluorspar properties have been opened in Madoc and northern Huntingdon townships. Mining began in 1905 and was particularly active during the periods 1916-21 and 1940-51. About 150,000 tons of fluorspar have been mined from the Madoc area, which has been the centre of fluorspar mining in Ontario.

The fluorspar occurs in fissure-filling veins with barite and calcite. The veins generally occupy northwest trending fractures associated with a period of post-Paleozoic northwest faulting. The most important fluorite deposits have been found along the Moira fault which extends in a northwest-southeast direction through Moira Lake. The fluorite veins cut both the Precambrian and Paleozoic rocks.

The fluorspar mines and occurrences in the map area are listed in the accompanying table, Guillet (1964, p. 26):

Fluorite Occurrences in the Madoc Area, Hastings County

Huntingdon Township

Concession	Lot	Name	Approximate Production (tons)
VIII.....	18.....	Palmateer.....	44
IX.....	15.....	Jones.....	-
XI.....	1.....	Williams.....	prospect
XI.....	14, E.½..	Howard (Hill).....	2,500
XI.....	14, W.½..	Johnston.....	187
XI.....	15.....	Wright.....	prospect
XII.....	2.....	Herrington S.....	13
XII.....	10.....	Blakely.....	5,026

Concession	Lot	Name	Approximate Production (tons)
XII.....	13.....	Noyes.....	25,000
XIII.....	7.....	South Reynolds...	100
XIII.....	10.....	Coe.....	114
XIII.....	11.....	Perry.....	8,000
XIII.....	11.....	Perry Lake.....	4,000
XIV.....	8.....	North Reynolds...	10
XIV.....	9, E.½..	Kilpatrick (Detomac).....	11,566
XIV.....	9,W.½...	Keene.....	5,000
XIV.....	10.....	Rogers.....	45,000
		Madoc Township	
I.....	1, E.½..	Lee Senior.....	1,600
I.....	1,2 W.½..	Wallbridge and Herrington.....	6,600
I.....	2, E.½..	Stewart.....	prospect
I.....	3.....	Ponton.....	1,500
I.....	4, W.½..	Miller.....	460
I.....	5.....	William Reynolds.	88
I.....	6.....	Rooks.....	100
I.....	9.....	Plain.....	20
III.....	2.....	Lee Junior.....	2,000
III.....	3, E.½..	McBeath.....	prospect
IV.....	1.....	Bailey.....	25,000
IV.....	2, W.½..	McIlroy.....	540

Concession	Lot	Name	Approximate Production (tons)
IV.....	14.....		prospect
V.....	1.....	Hill.....	prospect

The fluorspar mines and occurrences of the Madoc area are described in a recent report entitled "Fluorspar in Ontario" by G. R. Guillet (1964). The reader is referred to this report for descriptions of individual properties.

Gold

Concession V, Lot 25

St. Joe Mine

In 1898, Slaght (1898, p. 89) described the workings of the St. Joe gold mine in lot 25, concession V, Madoc township, 1000 feet west of the Hastings road. The main vein strikes east-west and a shaft was sunk to 30 feet on the vein. An open cut was put down on the vein and some 300 tons of ore was mined. Assays given by Slaght (1898, p. 89) range from $2 to $60 per ton.

Gold

Concession V, Lot 28

Bannockburn Gold Mine

The Bannockburn gold mine is located on lot 28, concession V, Madoc township, about $\frac{1}{4}$ mile west of the village of Bannockburn. The date of discovery of the mine is not recorded in Ontario Bureau of Mines reports, but Slaght (1895, p. 264) in 1895 states that the mine was discovered "several years ago". Work recommenced in 1894 and continued until 1898. A 10 stamp mill was erected on the property.

Gold occurs in a quartz vein which strikes north-south and dips vertically to steeply east. The vein has been stripped and trenched for a continuous length of 700 feet along strike and four shafts and several open cuts were put down. The deepest shaft is reported to be 75 feet deep with drifting extending both ways from the shaft. The quartz vein is on the contact between an intrusive body on the west which grades from biotite syenite to diorite, and rusty schists on the east. The schists strike north-south and dip vertically. There is strong shearing along the hanging wall or east wall of the vein with development of mica and carbonate schists. The vein is up to 3 feet wide and in places consists of three or more parallel veins. There is some carbonate and pyrite in the quartz. High gold values have been reported. A grab sample of quartz vein material taken by the author assayed $6.00 gold per ton.

Gold

Concession X, Lots 14 and 15, Madoc Township

Sophia or Diamond Mine

In 1896, a quartz vein carrying arsenopyrite and gold was discovered on lot 14, concession X, Madoc township, half a mile west of Queensborough. The veins occur in volcanic rocks which strike N.W. and dip vertically. DeKalb (1901, p. 117) reports that "there are two veins on the property, viz. The 'mispickel vein' with a course due north and south, and the 'free milling' vein running northwest and southeast." On the mispickel vein a shaft (No. 1) was sunk to 60 feet. Shaft No. 2 on the free milling vein had a depth of 105 feet with levels at 60 and 100 feet. No. 3 shaft was put down on the free milling vein. Operations were suspended in 1901 but workings were dewatered in 1908. No further work has been reported.

Iron, Copper

Concession V, Lot 17

Coe Iron Mine

Eldorado Copper Mine

In 1901, the Coe iron mine was opened in lot 17, concession V, Madoc township on top of a low ridge about 3/8 of a mile west of Eldorado village. Red hematite ore was mined from three open cuts: the east pit was 60 X 50 feet by 45 feet deep; the centre pit was 46 by 20 feet by 45 feet deep, and the west pit was 20 by 15 feet by 10 feet deep. Mining of hematite continued in 1902 and 1903, and in 1903 chalcopyrite was found in the bottom of the mine at a depth of 75 feet. Good chalcopyrite and chalcocite ore averaging 4 to 10 percent copper was reported, Corkill (1906, p. 90). The mine was then known as the Eldorado copper mine and it was worked until about 1907. A copper smelter was erected on the property in 1906.

Corkill (1906, p. 90) describes the property as follows: "The north or hanging wall of the ore body is granite, and the south or footwall is crystalline limestone. The ore body runs east and west in a wide open fissure in the contact between the granite and the limestone. The open cut worked for iron is 75 feet in depth. From this level a shaft has been sunk 75 feet with drifts and crosscuts at different levels. At a depth of 35 feet in the shaft a level has been driven, and 105 feet of drifting done. Twenty feet deeper in the shaft, another level has been run and 170 feet of drifting done. At the 75 foot level there are 175 feet of drifting. The ore body which

occurs as a shoot, dips to the northeast."

In 1906, the mine was reported to be 300 feet deep, Corkill (1907, p. 76).

Iron

Concession I, Lot 18

Dufferin Mine

The Dufferin iron mine is located on the west half of lot 18, concession I, Madoc township and extends westward into Marmora township. The magnetite zone is in blue-grey fine-grained Grenville marble near the north contact of the Deloro granite batholith. The marble strikes N.70°E. and dips 50 to 60° to the south.

A series of open cuts trend N.70°E. from the township boundary for a length of over 800 feet. The open cuts range from 150 feet by 30 feet by 25 feet deep to 50 feet by 15feet by 20 feet deep. Magnetite occurs in disseminated and massive form in the marble. Gibson (1937, p. 115) states that the Dufferin ore zone "has a length of 1700 feet and a width of 20 to 120 feet. The ore assayed 63.80 percent iron, 0.23 percent sulphur and 2.30 percent manganese."

Iron

Concession V, Lot 11

Seymour Mine

The Seymour iron mine is on the west half of lot 11, Concession V, Madoc township about 200 feet east of the road. An open cut 180 feet long and 20 to 25 feet wide trends east-west in basic volcanic rocks. The cut is reported to have a shaft 125 feet deep. Fine-grained disseminated magnetite occurs in the basic volcanics. The mine was operated from 1837 to 1845. Uraconite was reported to have been found in fissures in the magnetite, Miller (1898, p. 232-3).

Iron

Concession V, Lot 12

Wallbridge Mine

The Wallbridge iron mine is in lot 12, concession V, Madoc township on the west side of Highway No. 62. Soft red hematite ore was mined from an open pit about 150 feet in diameter and reported to be 60 feet deep. Some of the mining was done prior to 1900, but the mine was still in operation in 1906 when it was supplying flux to the Stanley Smelting Works at Bannockburn. The property was drilled in 1952 by Trent River Iron Limited, Rose (1958, p. 65).

The hematite ore occurred in ferruginous dolomitic marble of the Grenville series. The marble is capped by a few feet of Ordovician limestone and conglomerate. The marble strikes east-west and dips steeply to the south. Rose (1958, p. 65) states that "hard and soft red hematite as mined apparently occurred in a large pocket in the crystalline carbonate rocks, at or near the contact with overlying Paleozoic rocks. A narrow band of soft red hematite was intersected in the crystalline carbonate rocks about 20 feet below the Paleozoic contact in a drill hole east of the main pit, so the hematite here is not entirely confined to the Paleozoic-Precambrian contact, in fact, most of the hematite occurs within the Precambrian rocks". Hematite, specularite, magnetite, goethite, pyrite and chalcopyrite are reported by Rose.

Iron

Concession V, Lot 15

Cook Iron Mine

The Cook iron mine is in lot 15, concession V, Madoc township, in a woodlot just east of a small swampy lake. In 1898 the mine was shipping 30 tons of ore per day from a small open pit 25 feet in diameter and 30 feet deep. The ore is hematite and magnetite in fine-grained grey crystalline limestone. Outcrops are scarce in the vicinity of the pit.

Iron

Concession VI, Lot 4

St. Charles Mine

The St. Charles iron mine is located on lot 4, concession VI, Madoc township about 1000 feet southwest of the Walsh farmhouse. The country rock is black basic volcanics. An open cut 100 feet long, 20 feet wide and 30 feet deep to water level trends north-south. The ore is magnetite which occurred in a lens in the basic volcanics. About 100 yards to the east of the pit, there are large outcrops of pink granite. The mine was worked in 1898 and 1899.

Iron

Concession VI, Lot 5

There is a hematite mine on lot 5, concession VI, Madoc township, 1000 feet west of the Walsh farmhouse. An open cut, measuring 130 feet long in a north-south direction, 20 feet wide and 30 feet deep, exposes a narrow band of hematite-bearing carbonate rock. The carbonate lens is in contact with granite on the west side. The east contact was not seen. Some magnetite is present. Red hematite is formed by the alteration of magnetite bearing ferruginous carbonate rock.

Another iron pit is located 600 feet south of the main pit.

Iron

Concession VI, Lot 7

Brennan Mine

The Brennan mine, located in lot 7, concession VI, Madoc township is reported to have shipped 250 tons of hematite ore in 1901, I. O. C. (1924, p. 222).

Iron

Concession VI, Lot 9, Madoc Township

Cameron Mine

Iron ore is reported to have been mined from the Cameron mine, in lot 9, concession VI, Madoc township, I. O. C. (1924, p. 222).

Iron

Concession VI, Lot 10

Sidmag Property

The Sidmag property is in lot 10, concession VI, Madoc township 3/8 of a mile east of Highway No. 62. The property was formerly known as the "49 acre mine". A narrow band of crystalline limestone 300 to 400 feet wide, striking N.30°W., lies between pink rhyolite on the west and pink medium-grained granite on the east. About a thousand feet south of the road a north-south trending line of pits has been put down in the limestone. These expose hematite, siderite and magnetite mineralization in the crystalline limestone. In 1956 a considerable amount of diamond drilling was done by Stratmat Limited and areas of siderite and magnetite mineralization were outlined in the limestone. Tonnage and grade values are not available.

Iron

Concession VI, Lot 12

Miller Mine

The Miller iron mine was operated in lot 12, concession VI, Madoc township in 1898. There was an open pit 34 feet deep, with a 38 foot shaft in the bottom of the pit. The ore is red hematite.

Iron

Concession VII, Lot 8

Sexsmith Mine

Several open pits were put down in lot 8, concession VII, Madoc township near the concession VI line. The pits are in white Grenville marble and expose magnetite mineralization. Some pyrite occurs in the magnetite which is fine-grained and massive. The property operated many years ago under the name Sexsmith mine. Little information is available on the operations.

Lead

Concession VI, Lot A

Hollandia Mine

The Hollandia lead mine is in lot A, concession VI, Madoc township, about two miles north of Bannockburn. The mine was opened in 1898 and several open cuts were put down. The mine later closed but re-opened in 1906 when there were four shafts. The east shaft is 132 feet deep. No. 1 shaft 70 feet to the west is 90 feet deep. No. 2 shatf 90 feet to the west of No. 1 is 65 feet deep and No. 3 shaft, the most westerly is 40 feet deep. 18 holes were drilled in 1956 by Teek Exploration Company, Limited.

The country rocks are rusty paragneiss and schist which strike N.40°E. and dip vertically. Galena occurs in a calcite vein which strikes N.40°W. and dips vertically or steeply northeast. The vein is 2 to 4 feet wide. The walls show slickensides. Alcock (1930, p. 156) reports that the ore is chiefly galena, with minor sphalerite and pyrite. The gangue is calcite with minor barite. High grade ore was reported to have been produced from the upper 20 to 40 feet of the vein.

From shaft No. 1 at a depth of 90 feet drifts were run east for 181 feet and west for 159 feet. Sampling of the vein along the drift is reported to have given values of 1 to 12 percent lead (Alcock 1930, p. 157).

Marble and Limestone

Madoc is the centre of a marble quarrying industry. The three principal operating companies are Stoklosar Marble Quarries Limited, Madoc Marble Quarries Limited† and Hastings Marble Products Limited.†

The principal quarry operations in the map-area are the following:

Madoc Township

Location	Type of Stone	Operator
Con. I, Lotll, S.W.$\frac{1}{4}$	Brown Pamelia limestone	Stoklosar Marble Quarries
Con. IV, Lot 9	Brown Pamelia limestone	Hastings Marble Products
Con. IV, Lot 10	Brown Pamelia limestone	Madoc Marble Quarries
Con. V, Lot 3	Black calcitic marble	Madoc Marble Quarries
Con. V, Lot 4, E.$\frac{1}{2}$	Black Calcitic marble	Hastings Marble Products
Con.V Lot 22	Yellow dolomitic marble	Hastings Marble Products
Con. VI, Lot 4	Black calcitic marble	Stoklosar Marble Quarries
* Con. VI, Lot 9	Green calcitic marble	Madoc Marble Quarries
* Con. VI, Lot 10	Green calcitic marble	Stoklosar Marble Quarries

† These companies were taken over in 1965 by Grenville Aggregate Specialties Ltd.

Madoc Township

Location	Type of Stone	Operator
Con. VI, Lot 19	Buff dolomitic marble	Stoklosar Marble Quarries
Con. VI, Lot 19	Buff dolomitic marble	Hastings Marble Products
Con. VI, Lot 20	Pink calcitic marble	Madoc Marble Quarries
Con. VI, Lot 22, E.$\frac{1}{2}$	Pink calcitic marble	Stoklosar Marble Quarries
Con. VIII, Lot 2	Pink dolomitic marble	Hastings Marble Products
* Con. VIII, Lot 12	Buff dolomitic marble	Stoklosar Marble Quarries
Con. VIII, Lot 15	Buff dolomitic marble	Madoc Marble Quarries
* Con. IX, Lot 1	White calcitic marble	Bonter Marble Company
Con. IX, Lot 2	White dolomitic marble	Hastings Marble Products

Huntingdon Tp.

Con. XIV, Lot 1	Green calcitic marble	Stoklosar Marble Quarries
Con. XIV, Lot 15	White dolomitic marble	Canada Talc Industries

* Inactive in 1964.

These marble quarries are described in a recent report entitled "Building Stones of Ontario, Part III, Marble", by D. F. Hewitt, 1964. The reader is referred to this report for descriptions of these quarries.

Pyrite

Concession VI, Lot 25, Madoc Township

Bannockburn Pyrite Mine

The Bannockburn pyrite mine is located in lot 25, concession VI, Madoc township, about a mile southeast of Bannockburn and 3/8 of a mile east of Highway No. 62. The mine was also known as the Jarman pyrite mine (1901-1907) and the Mundic mine (1918-1919). Initial openings were made on the property in 1898 when a gossan zone 8 to 15 feet thick was discovered. Shipments were made in 1898 and 1899 by Stephen Wellington of Madoc to the Hamilton Iron and Steel Company, (Wilson, 1912, p. 62). The gossan is reported to have run over 38 percent iron. In 1900, the American Madoc Mining Company began operations under the name Jarman pyrite mine. An open pit was sunk on the pyrite lens; the pit measured 32 by 85 feet, by 84 feet deep. The pyrite occurred as bedded lenses in grey-green chlorite schist striking east-west and dipping 55°N. Soft chlorite schist formed the hanging wall of the pit and led to dangerous mining conditions which caused the pit to be abandoned in 1901.

A second pyrite ore body was located about 500 feet south of the open pit and a shaft was sunk in 1901 on this pyrite lens which was reported to be about 160 feet long and 8 to 15 feet wide. The south lens and its enclosing chlorite schist strike slightly west of north. There is a folded structure between the two pyrite deposits which is probably an anticline pitching northwest. The American Madoc Mining Company

continued to produce pyrite from the south ore body until 1907 when the mine closed apparently due to unsafe mining conditions. At the time of closing, the shaft was 275 feet down with levels at 64, 113 and 175 feet. Wilson (1912, p. 63) reports that the monthly production was about 580 tons averaging 40 percent sulphur. He reports that the ore fell off neither in grade nor quality with depth. The mine was not worked out when closed.

The country rock is Grenville marble and soft grey chlorite schist. The fine-grained, granular pyrite occurs in the chlorite schist. There is little outcrop in the vicinity of the open pit and shaft which are on the west side of an area of low swampy ground.

~~Iron~~ Pyrite

Concession VII, Lot 9

Farrell Mine

A number of test pits have been put down in crystalline limestone in lot 9, concession VII, Madoc township. The marble band strikes northwest and is flanked on the northeast by pink granite. Gossan and pyrite were encountered in the pits. Janes (1952, p. 39) reports that "a sample, representing about 75 percent of the dump material, along side a 25 foot shaft, is reported as having contained 40.65 percent sulphur. The pyrite deposit on this prospect is about 5 feet wide with crystalline limestone as the gangue material."

Pyrite and Iron

Concession VII, Lot 6

McKenty Mine

The McKenty mine is in lot 6, concession VII, Madoc township, 2 miles east of Madoc. Hematite was mined and shipped from this property about 1877, Wilson (1912, p. 69). An open pit reported to be 60 feet deep, has caved in. Some hematite lumps have a core of pyrite.

Pyrite

Concession IX, Lot 10, South Half

Davis Prospect

An occurrence of pyrite in marble has been reported in the south half of lot 10, concession IX, Madoc township. A test pit 10 feet deep was put down on the deposit, Wilson (1912, p. 69).

Pyrite

Concession X, Lot 9, North Half

Canadian Sulphur Ore Company or Queensboro Mine

The pyrite property operated by Canadian Sulphur Ore Co. from 1910 to 1919, is located in the north half of lot 9, concession X, Madoc township. The mine was discovered by Stephen Wellington; a gossan zone 500 feet long, 200 feet wide and 12 feet deep was opened up in 1906. On sinking two shafts pyrite was encountered and the first shipment was made in 1908. Canadian Sulphur Ore Company took over the property in 1910.

The mine workings consisted of 3 shafts and 2 open cuts. Shafts 1 and 2 were 75 and 100 feet deep respectively. The main shaft, No. 3, reached a depth of 460 feet in 1919 with six levels developed.

Pyrite occurs in massive lenses along the contact between rusty schist to the south and quartzite to the north. Some pyritic black slate is present.At open pits 3 and 4, the pyrite lenses are 25 feet wide. The pyrite ore is reported to have been of two grades. Miller and Knight (1914, p. 98) state that "the low grade is a siliceous, distinctly banded pyrites which contains about 35 percent of sulphur. At times, it passes into pure quartzite in a short distance. The better quality of mineral, which is hard and dense, is faintly banded in places and contains from 46 to 49 percent of sulphur. The richness of the mineral may depend to some extent on the nature of the country rock. The pyrites as well as the adjacent rock, is fractured in all directions, the cracks being filled with small

veinlets of quartz, calcite and more coarsely crystallized pyrites." The pyrites has been brecciated and "the deposits consist of large angular pieces of pyrites, slate and quartzite cemented by quartz, calcite and secondary pyrites." A little pyrrhotite and chalcopyrite is present.

Pyrite

Concession XI, Lot 11, Madoc Township

British American, Queensboro or Blakely Mine

Mining began on a pyrite deposit in lot 11, concession XI, Madoc township about a mile southwest of Queensboro, in 1905. In 1905 and 1906, sixty-five cars of pyrite ore averaging 45 percent sulphur are reported to have been shipped by the British American Development Company. Pyrite is reported to have occurred in lenses, one of which had a length of 50 feet and a width of 15 feet, in garnetiferous rusty schist near the contact with rhyolite. The schist zone strikes north and lies between marble to the west and volcanics to the east. The schist zone is intruded by rhyolite which, on the property, lies west of the schist.

A shaft was sunk on the main pyrite lens to a depth of 135 feet with drifting on the 50 to 85 foot levels. A second shaft was put down 150 feet to the west to a depth of 30 feet.

Wilson (1912, p. 68) reports that an open cut was put down 100 feet southwest of the main shaft on a zone of pyrite-bearing schist. Lenses of pyrite 4 to 5 feet thick were mined. One lens contained disseminated chalcopyrite. The pyrite is coarse-grained and massive.

To the west of the workings, in an open cut, there is a 2 foot quartz vein carrying chalcopyrite and jamesonite. Massive sphalerite can be seen just east of the open cuts and zincblende has been reported with the pyrite in places.

The mine was apparently closed in 1908.

Stone for Roofing Granules

From 1940 to 1956, Building Products Limited operated several granite and rhyolite quarries in the Madoc area for the production of roofing granules. The principal quarries were the following:

Location	Product
Madoc Township	
Concession III, Lot 8	Red granite
Concession V, Lot 11	Black rhyolite
Concession VIII, Lot 8	Pink rholite
Concession X, Lot 9	White rhyolite
Huntingdon Township	
Concession XIV, Lot 18	Red granite

Talc

Concession V, Lot 20

Eldorado Talc Mine

The Eldorado talc mine is on the east ~~shore~~ bank of the Moira River, in lot 20, concession V, Madoc township, a mile and a quarter northwest of Eldorado village. The mine was worked from 1911 to 1920 but has been idle since. In 1911, The Canadian Talc and Silica Company sank a 75 foot inclined shaft and erected a mill. The company was re-organized in 1914 as Eldorite Limited and operated until 1916. In 1919, the Eldorado Mining and Milling Company took over the property and operated until November 1920.

Wilson (1926, p. 75-76) describes the workings as follows: "Except for a few small prospect pits (Nos. 1 to 5), none of which is more than 10 feet deep, all the development work in the Eldorado property has been performed from two shafts about 210 feet apart; No. 1 inclined 75 degrees to the west and No. 2 inclined 75 degrees to the northwest. These shafts are connected at a depth of 65 feet by a succession of large openings up to 60 feet in diameter formed in mining the talc-dolomite schist. At 200 feet, the shafts are connected by a drift which has been extended 30 feet to the southwest of shaft No. 1 and 160 feet to the northeast of shaft No. 2." Eleven short crosscuts were driven off this drift.

Talc occurs in a tremolite-dolomite schist which also carries quartz. The talc content is reported by Wilson (1926, p. 73) to average about 20 percent. The width of the talc-bearing

schist is approximately 100 feet. The talc schist zone extends northwest from shaft No. 1 with a dip of 40 to 60°N.E. At the shaft, the zone appears to fold around to the southwest in an anticlinal structure. The rocks are highly folded and crenulated. There is a strong mineral lineation in the shafts pitching northeast at about 40°. Dikes of granite cut the marble on lot 21, concession IV.

"A short distance to the east of the main deposit, a 20-foot band of crumpled, dark grey, graphitic talc schist outcrops, and in 1919 a separate small mill unit was installed to grind this material for the rubber and foundry trades", Spence, 1940, p. 73.

Talc

Concession XI, Lot 15

An occurrence of talc-dolomite schist is reported by Wilson (1926, p. 77) in lot 15, concession XI, Madoc township. The talc schist zone, 5 feet wide, is exposed in a pit measuring 10 by 10 by 5 feet deep. The talc deposit is in basic volcanics.

Talc

Concession XIV, Lot 15, N.E.¼, Huntingdon Township

Price ~~Property~~ Occurrence

In 1941 and 1942, the Trent Mining Syndicate Limited sunk two shafts on the northeast quarter of lot 15, concession XIV, Huntingdon township. The principal shaft is 90 feet deep with levels at 40 and 80 feet. The dolomite strikes N.10°E. and dips 55°W. On the 40 foot level, a drift goes 140 feet north along a narrow sericite-talc schist zone 2 to 5 feet wide cutting dolomite. The footwall is a green sericite carbonate schist; the hanging wall is black amphibolite and graphitic schist. An 85-foot crosscut running west from the shaft on the 40-foot level exposes dark coloured graphitic schist and amphibolite. On the 80-foot level, 108 feet of drifting is reported.

A pit measuring 15 by 12 feet and 4 feet deep was put down in fine-grained buff to white marble 150 feet northwest of the shaft. Pits east of the shaft expose foliated sericite carbonate schist which is green in colour due to chlorite and serpentine.

Talc

Concession XIV, Lot 16, Huntingdon Township

Three shafts were put down in lot 16, concession XIV, Huntingdon township, between 1917 and 1919 by the International Pulp Company of Gouverneur, N.Y., Wilson (1926, pp. 89-90).

Shaft No. 1, a few hundred feet south of the farm buildings, is 50 feet deep with 130 feet of drifting and cross-cutting. Rock on the dump consists of mica schist, dolomite, some talc schist and massive talc.

Shaft No. 2, near the west boundary of the lot, is reported to be 60 feet deep with 110 feet of drifting. The dump consists of talc-tremolite schist and dolomite.

Shaft No. 3, 70 feet northeast of shaft No. 1, is 25 feet deep and the excavated material is grey to white talc schist.

Concession XIV, Lot 14, Huntingdon township (Henderson Mine)
Concession XIV, Lot 15, Huntingdon township (Conley Mine)

Canada Talc Industries Limited

Canada Talc Industries Limited operates the Henderson and Conley talc mines at Madoc. Talc was discovered at Madoc in the 1880's and in 1896 the first talc mine, the Henderson, was opened. This mine was operated by the A. H. Robbins Company of New York until 1904, and then by Cross and Wellington of Madoc, under contract with the Robbins Company until 1918, when the property was purchased by the George H. Gillespie Company of Madoc. Henderson Mines Limited, a subsidiary of the George H. Gillespie Company, operated the mine until 1937, when it was taken over by Canada Talc Limited.

The Conley mine is on the northeastward extension of the Henderson orebody. It was discovered in 1911 by Henderson and Pitt, and development work was done on the property by the Hungerford Syndicate in 1912 and 1913. In 1915 the Anglo - American Talc Corporation took over the property and worked it until 1921, when Asbestos Pulp Company took over the operation. The company was reorganized as Canada Talc Company in 1929, and as Canada Talc Limited in 1937 on merger of the Henderson and Conley properties. The company operated the Conley mine until 1951, when Canada Talc Limited was purchased by Canada Talc Industries Limited. Since 1937 Canada Talc Limited and Canada Talc Industries Limited operated both the Henderson and Conley mines.

Current production of talc by Canada Talc Industries amounts to about 8,000 tons per year. A substantial tonnage of white terrazzo

chips are also produced. Total talc production from the Madoc deposits up to the end of 1965 amounted to 722,145 tons valued at $8,181,173.

Workings

Henderson Mine: The talc deposit was first opened up on the Henderson property, lot 14, concession XIV, Huntingdon township, by open pit methods, and open pit mining continued until 1908 when No. 1 shaft was sunk at the west end of the orebody. By 1911 the No. 1 shaft was down to 185 feet, with levels at 75,120 and 185 feet. Mining was by square set timbering on the upper levels, but subsequently by shrinkage stoping. In 1912 a second shaft was put down east of No. 1 shaft towards the east end of the orebody and in 1913 No. 1 shaft was abandoned due to caving. A fourth level was established at 231 feet and mining continued. However, both No. 1 and No. 2 shafts were in the orebody and as mining continued No. 2 was also in danger of caving in the bad ground of the talc orebody. In 1920 No. 3 shaft was put down in the country rock between shafts 1 and 2, well to the north of the orebody, and this shaft, now known as No. 4 shaft of the combined Conley - Henderson property, is still in use as an escapeway. No. 1 and No. 2 shafts were lost when the ground caved, and the workings are now caved from the surface open pit to the fifth level (303 feet). By 1928 work was carried down to the sixth level (371 feet) and by 1933 drives had been carried out to the end of the ore both east and west of the shaft. In 1938 the shaft was deepened to 541 feet and a level cut at 443 feet. This level, the 7th was developed in 1943 and work was carried out on this level for many years by Canada Talc Industries. At the

present time a new and deeper level is being developed at the Henderson mine from a cross cut from the 3rd level (542 feet) at the Conley mine.

Conley Mine: The Conley mine, located on the west half of lot 15, concession XIV, Huntingdon township, was originally developed on the northeastward extension of the Henderson orebody. It did not outcrop, but was discovered by test pitting. In 1916 No. 1 shaft was sunk about 100 feet east of the Henderson line in the wallrock to the south of the ore zone. Levels were established at 65 and 130 feet. In 1919 No. 2 shaft was started 300 feet northeast of the main shaft. This shaft was carried to a depth of 168 feet where it was found that the ore had pinched out with depth in this northeast shaft, so subsequent work was carried out entirely from No. 1 shaft. By 1929 the orebody was developed to the sixth level at a depth of 390 feet. The vein was reported to average 15 feet in width, with a maximum width of 66 feet. The ore length on the first level was about 400 feet eastward from the Henderson line, while on the eighth level the ore extended only 150 feet east of the Henderson line. The seventh level was opened in 1933 at a depth of 437 feet. Subsequently in 1934 the eighth level at 470 feet was opened by means of a winze in the ore from the seventh level at a point 20 feet east of the shaft. In 1934 a crosscut driven north on the fourth level intersected a new orebody, discovered by diamond drilling, 650 feet north of the old No. 1 shaft; some stoping was carried out.

In 1935 No. 3 shaft was sunk near the new orebody. The first level for No. 3 shaft was established at 270 feet, this level being

connected to the workings at No. 1 shaft by a long crosscut which joined these workings at the fourth level.

In 1938, after the merger of the Conley and Henderson mines, the workings of these mines were joined by a crosscut from the 4th level of No. 1 shaft, Conley mine. This reached the Henderson workings between the 4th and 5th levels, and is reached by a raise from the 5th level. In 1942 the Conley No. 3 shaft was deepened to 383 feet and a second level established at 370 feet. In 1964 the Conley No. 3 shaft was deepened to 611 feet with the third level established at 542 feet and a loading pocket at 584 feet. From the Conley third level at No. 3 shaft a crosscut was run to intersect the Henderson orebody below the Henderson seventh level and development on this new level was begun on the Henderson side. At the present time (1966) the main production of marble and talc is coming from the 3rd level Conley mine and adjacent Henderson workings. The old Conley workings on No. 1 and No. 2 shafts are now sealed off.

General Geology

The talc ore bodies occur in Grenville crystalline dolomite of Precambrian age. The Grenville formations in the vicinity of the mine consist of tremolitic crystalline dolomite and dolomitic limestone, interbanded quartzite and crystalline dolomite, quartzite, and talc mica schist. The regional structure appears to be anticlinal (Sandomirsky, 1954), with the anticline pitching steeply to the southwest. The west limb strikes N10 to 20°W and dips vertically. The south limb strikes N70°E and dips vertically to overturned 70° to the north. Strong dragfolding and crenulation can be observed on both limbs of the fold. The crest of the fold appears to be just west of the open pit on the Henderson property.

The talc occurs as tabular hydrothermal replacement bodies in crystalline dolomite. The Grenville metasediments are cut by basic dikes which were named "madocite" by M. E. Wilson (1926). These dark-coloured dikes consist predominantly of brown tourmaline, amber mica, tremolite and plagioclase with minor amounts of pyrite, arsenopyrite, quartz, actinolite, titanite, apatite and zircon. In places the madocite dikes appear to have chilled margins against the dolomite. These dikes are pre-faulting as some of them are displaced by faulting, and are folded in the general folding of the Grenville metasediments. The Grenville metasediments are also intruded by the Moira granite, a pink albitic granite, which outcrops southeast of No. 1 shaft on the Conley property. Wilson (1926) believes that the Moira granite was the source of the madocite dikes and the probable source of the hydrothermal solutions which formed the talc replacement bodies.

The orebodies lie within the crystalline dolomite formation, which consists of well-banded grey and white crystalline dolomite and tremolitic dolomite. Tremolite occurs in needles and blades distributed through the rock and in clots, knots and bands in irregular segregations in the dolomite. The banding is from 2 to 6 inches in width, and relatively persistent. Some of the tremolitic dolomite also contains talc and white mica. To the north of the ore zone in the Henderson mine there is a band of mottled brecciated dolomite consisting of fine-grained dark grey dolomite in a matrix of white tremolitic dolomite. This appears to be incipient hydrothermal alteration of brecciated dolomite to tremolite, and probably was the initial step in the dolomite - tremolite - talc hydrothermal alteration. Other lithologic types noted in the mine

workings include dense, fine-grained, apple green steatite, plums of good quality pure white foliated talc and zones of rather hard mica - talc schist. Pyrite crystals occur scattered through the various rock types.

Bands of grey white fine-grained quartzite occur in the mine workings. On the surface south of the main pit, outcrops of well-bedded quartzite in 1 to 3 inch beds are exposed. The beds of quartzite are strongly crumpled and folded and in places brecciated. Interlaminated tremolitic crystalline dolomite and quartzite occur in narrow alternating bands which weather on outcrop to give a distinctive ribbed appearance. Some quartz stringers or mobilized quartzite cut the dolomite.

Remnants of Paleozoic conglomerate rest with unconformity on the Precambrian metasediments.

Structure

The general structure of the area is not well known due to lack of outcrop, but, as mentioned above, the major structure appears to be anticlinal with the Henderson and old Conley orebodies occurring on the south limb of an anticline pitching to the southwest. There is strong dragfolding and crenulation on both arms of the fold. The detailed structure within the mine workings is not well known since the workings were not mapped during development and most of them are now inaccessible.

There is a considerable amount of faulting, although the fault pattern has not been worked out. Wilson (1926) notes that on the fourth level of the Henderson mine the talc orebody is cut by an overthrust fault about 50 feet west of the No. 2 shaft. This fault strikes roughly east-west and dips about 45° to 50° north. On the

fourth level there is an apparent horizontal displacement of about 50 feet. This displacement is reported to fade out toward the surface into an open fold. This fault zone also appears on the fifth and sixth levels of the Henderson mine. What may be a subsidiary fault striking somewhat south of west and dipping vertically can be seen just north of the ore zone on the seventh level of the Henderson mine. Zones of faulting are also seen in the Henderson - Conley crosscut and in the Conley workings at No. 3 shaft, but no data on these faults are available.

Orebodies

The Henderson orebody consisted of a tabular sheet of rather pure white foliated talc, with some impurities of calcite, dolomite, pyrite and tremolite. This talc body lies on the south limb of the major anticline near its crest. The west end of the orebody appears to occupy the crest of the fold and at the west end of the orebody the ore pitches to the southwest. The ore sheet appeared to have its maximum extent on the fifth level where the workings extended east-west for over 700 feet.

Wilson describes the orebody as resembling an interrogation mark lying with its top to the west and open to the north. The orebody pitches to the southwest at its west end, but dips north toward its east end. Hence the south limb of the anticline is slightly overturned toward the north. The orebody extends downward to the new Conley third level, a depth of 540 feet. The width ranges from a few feet to 65 feet. On the seventh level the ore zone consists of a folded band of steatite and talc schist containing some plums of white foliated talc. The large body of pure foliated talc mined on the upper levels has apparently changed in character

on the lower levels, and is represented by more tremolitic dolomitic material. Toward the east end of the orebody strong folding, faulting and intrusion of madocite dikes complicate the picture.

The south or original orebody on the Conley property was the eastward extension of the Henderson orebody, and consisted of foliated white talc with some impurities of calcite, tremolite and dolomite. Laterally it had a maximium length on the third (190 foot) level of about 400 feet east from the Henderson line. The ore pitched to the west and only 150 feet of ore extended eastward from the Henderson line on the bottom (eighth) level at 470 feet depth. The width of the ore zone averaged 15 feet with a maximum of 60 feet. Between the fourth and fifth levels a wide madocite dike cut through the orebody making mining of this stope area difficult. The talc ore sheet is closely folded and some variation in width of the ore zone is undoubtedly due to flowage of the soft talc between more competent bands of tremolitic dolomite. Along the margins and extremities of the ore zone the foliated talc schist gives way to a fine-grained massive grey to apple green steatite rock containing patches of foliated talc.

The north workings of the Conley mine centered about No. 3 shaft have yielded most of the production from the property for the past 10 years. This ore consists of a talcose tremolitic dolomite often containing less than 30 percent talc. The dolomite in this area is highly contorted and frequently discoloured red, grey or black. Stoping has been carried out both north and south of the shaft and the ore appears to consist of irregular talc - tremolite replacement in crystalline white dolomite. Development had been

carried out largely on the first level at 270 feet, but recent work has been concentrated on the third level at 542 feet.

Origin of the Talc

The best explanation as to the origin of these talc deposits is that of Wilson (1926) who regarded them as hydrothermal replacement deposits. Conformable sheet-like bodies of talc were developed from the Grenville dolomite by the introduction of hydrothermal solutions probably originating from the neighbouring Moira granite. These hot water silica-bearing solutions ascended fractures and faults on the south limb of the anticline and altered the dolomite first to tremolite and then to talc. Evidence of this dolomite - tremolite - talc transition can been seen in thin sections of the rocks from the deposit. Subsequent folding and faulting is responsible for the crenulation, thickening and offsetting of the talc ore sheets. The madocite dikes and the hydrothermal solutions probably had a common origin in the Moira granite magma. The talc does not appear to be particularly associated genetically or spatially with the dikes themselves.

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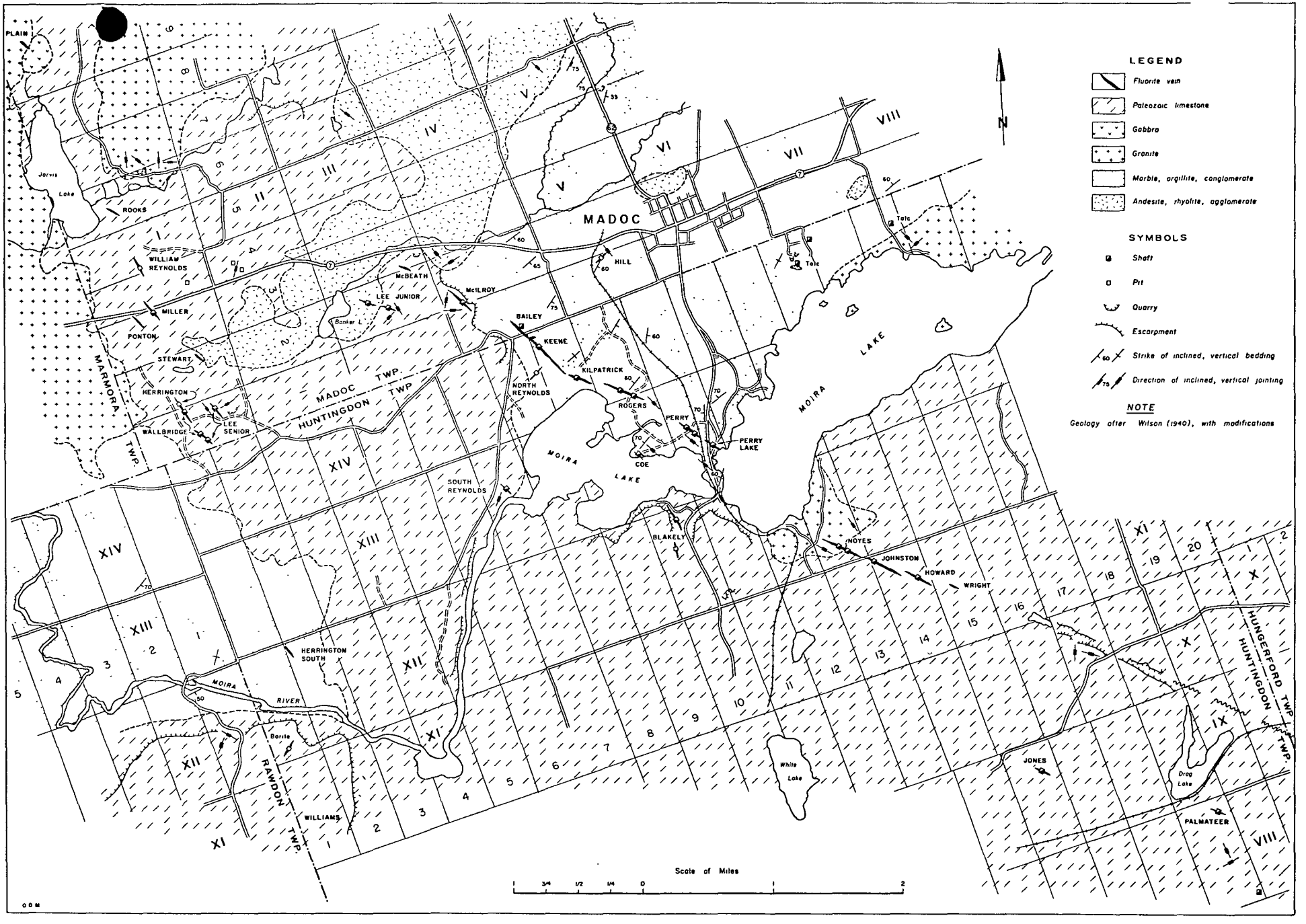
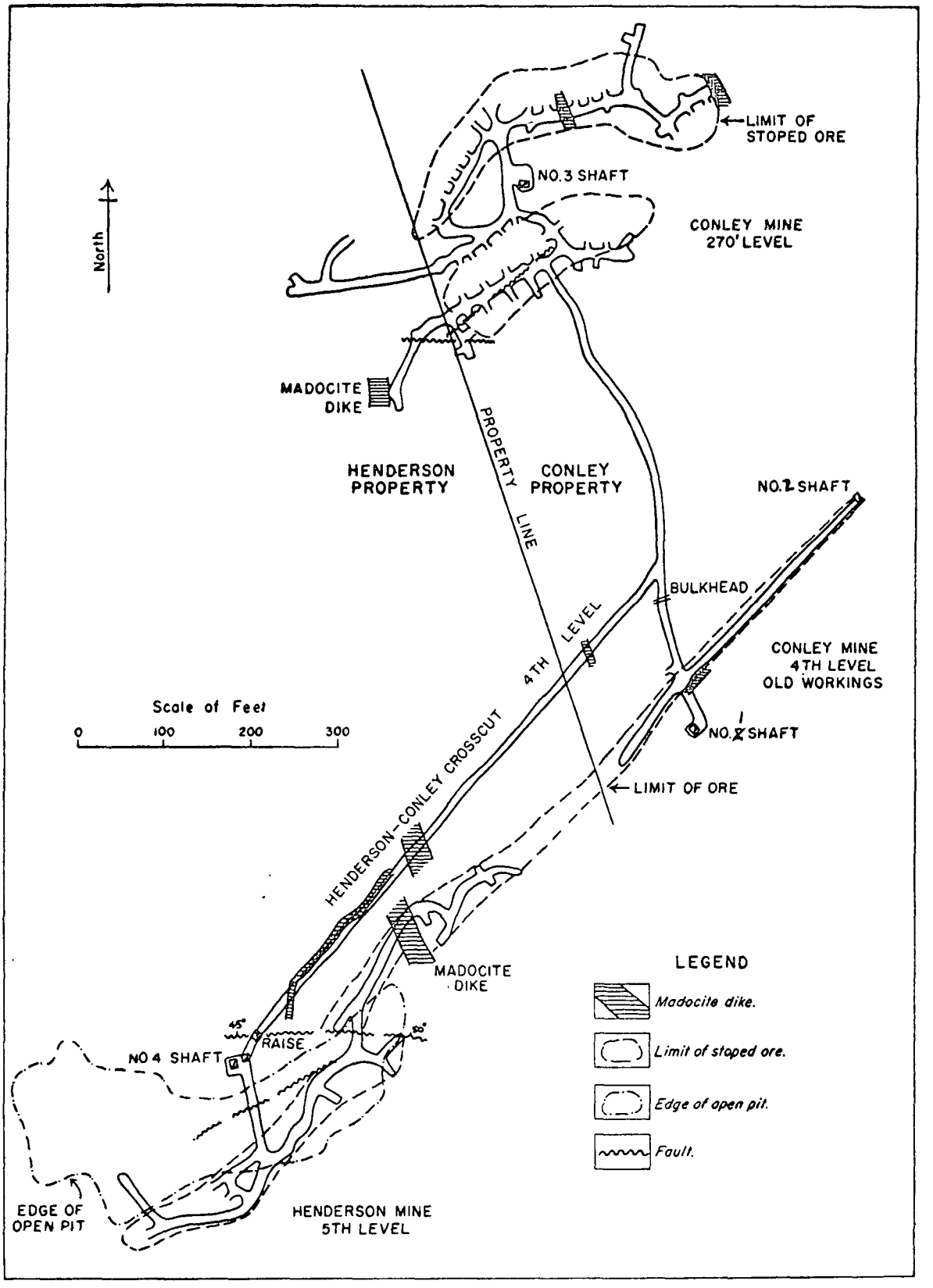


Figure 9—Fluorite occurrences in the Madoc area.

Fig 1



Composite plan of Henderson and Conley mines, Canada Talc Industries, Madoc, Ontario.

Figure 2.2

3642

Fig 2

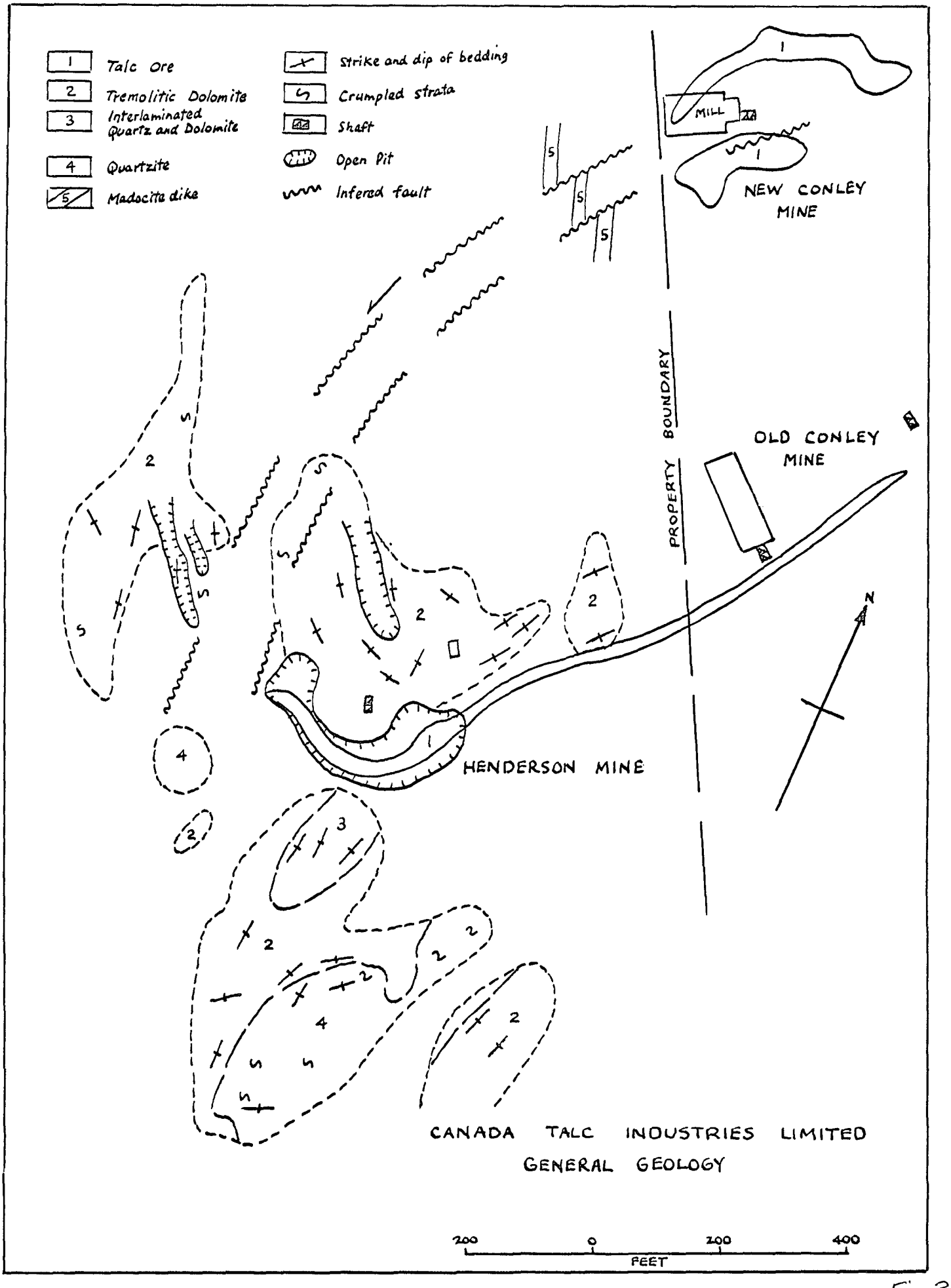

1 Talc Ore
2 Tremolitic Dolomite
3 Interlaminated Quartz and Dolomite
4 Quartzite
5 Madocite dike
Strike and dip of bedding
Crumpled strata
Shaft
Open Pit
Infered fault
MILL
NEW CONLEY MINE
OLD CONLEY MINE
PROPERTY BOUNDARY
HENDERSON MINE
N
CANADA TALC INDUSTRIES LIMITED
GENERAL GEOLOGY
200 0 200 400
FEET

Fig 3

ONTARIO DEPARTMENT OF MINES

PRELIMINARY GEOLOGICAL MAP No. P.368

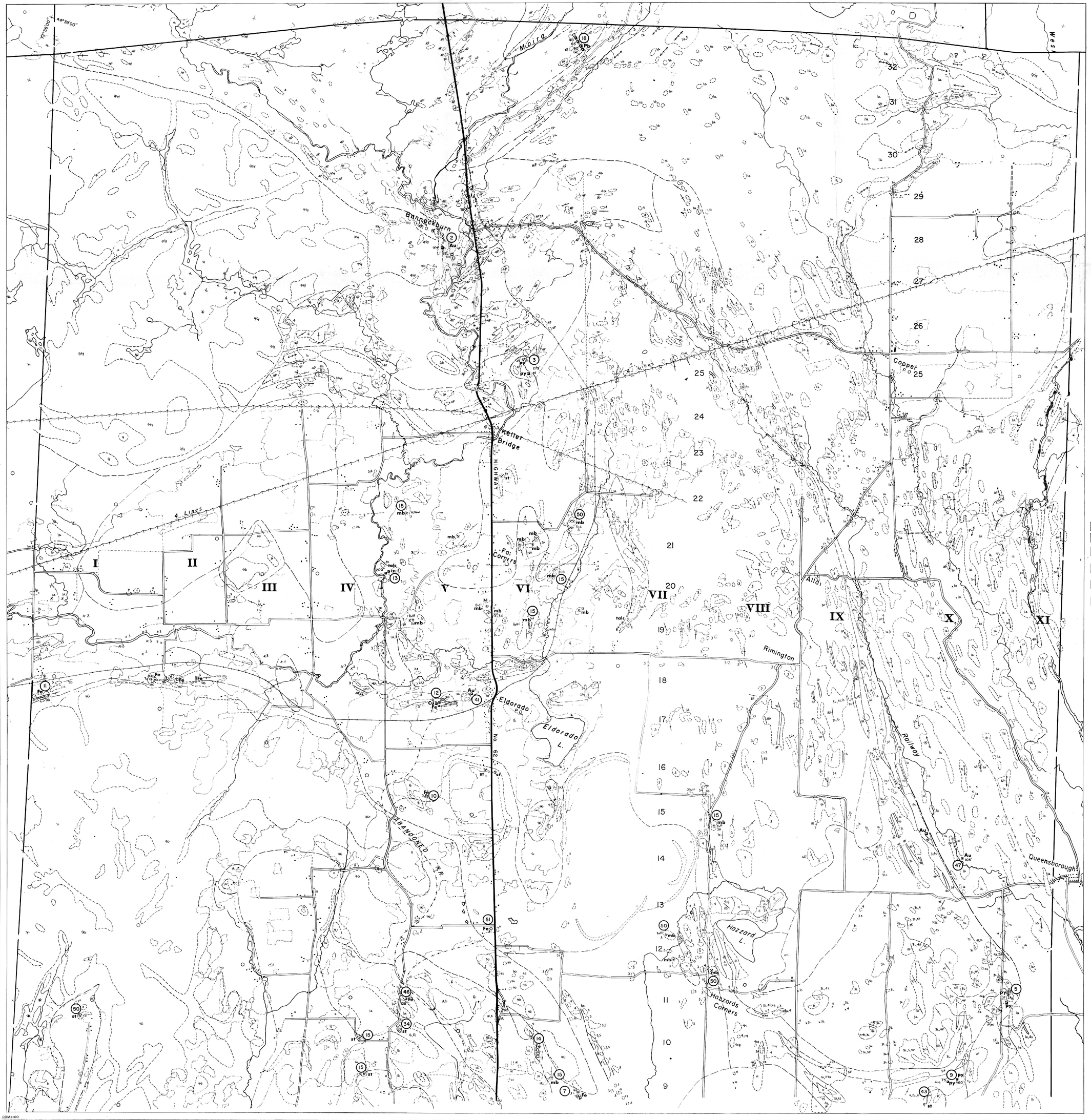
MADOC TOWNSHIP

(North Part)

HASTINGS COUNTY

Scale 1 inch to ½ mile

N.T.S. Reference 31C/12E, 31C/11W
G.S.C. Aeromagnetic Maps 14G, 95G



LEGEND FOR P.368 AND P.369

PALEOZOIC

11 — Black River limestone

PRECAMBRIAN

Plutonic Rocks

10 — 10 Diabase

9 — 9 Granite and syenite undifferentiated
9G Granite
9Sy Syenite

8 — 8 Migmatite

7 — 7 Grey granodiorite

6 — 6 Diorite and gabbro undifferentiated
6a Diorite
6b Gabbro

Metasediments and Metavolcanics

Metasediments

5 — 5 Quartzite and quartzo-feldspathic rocks
5Q Quartzite
5F Felsite

4 — 4 Pelitic rocks
4a Argillite, greywacke
4P Paragneiss
4s Schist
4cg Conglomerate

3 — 3 Marble undifferentiated
3d Dolomitic marble
3L Calcitic marble
3s Lime silicate rock

2 — 2A Para-amphibolite
2Ag Garnet amphibolite

Metavolcanics

Basic Metavolcanics

1 — 1a Amphibolite, amphibolite schist
1b Massive andesite
1agg Agglomerate
1c Tuff
1Pl Pillow lava

Acid Metavolcanics

1R Rhyolite
1Rt Rhyolite tuff
1F Felsite
1Rbx Rhyolite breccia

bx Breccia

GEOLOGICAL AND MINING SYMBOLS

- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, top unknown; (inclined, vertical).
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (horizontal, inclined, vertical).
- Gneissosity, (horizontal, inclined, vertical).
- Lineation with plunge.
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Fault; (observed, assumed).
- 300' Shaft; depth in feet.
- Quarry.

LIST OF PROPERTIES, MINES AND MINERAL OCCURRENCES

1.	Bailey mine (Mrs. S.D. Vale)	fl
2.	Bannockburn mine	Au
3.	Bannockburn pyrite mine	py
4.	Blakely Fluorspar mine (Stoklosar Marble Quarries)	fl
5.	Blakely pyrite mine (Earl Sager)	py
6.	Brennan mine	Fe
7.	Cameron mine	Fe
8.	Canada Talc Industries Ltd.	talc
9.	Canadian Sulphur Ore Company (Earl Sager)	py
10.	Cook mine	Fe
11.	Dufferin mine (Bruce C. Robson)	Fe
12.	Eldorado copper mine	Cu
13.	Eldorado talc mine	talc
14.	Forty-nine acre mine (Bruce C. Robson)	Fe
15.	Grenville Aggregate Specialties Ltd.	mb
16.	Herrington mine	fl
17.	Hill mine	fl
18.	Hollandia mine	Pb
19.	Howard (Hill) mine	fl
	Huntingdon Fluorspar Mines Ltd.	fl
20.	Coe mine	
21.	Johnston mine	
22.	Kilpatrick mine	
23.	McIlroy mine	
24.	Noyes mine	
25.	Perry mine	
26.	Perry Lake mine	
27.	Rogers mine	
28.	Jones mine	fl
29.	Keene mine	fl
30.	Lee Junior mine (Philip Morris)	fl
31.	Lee Senior mine	fl
32.	McBeath mine	fl
33.	Miller mine	fl
34.	Minnesota Minerals Ltd.	st
35.	Minnesota Minerals Ltd.	st (red granite)
36.	Palmateer mine	fl
37.	Ponton mine	fl
38.	Reynolds mine (Mrs. A. Symon)	fl
39.	Reynolds North mine	fl
40.	Reynolds South mine	fl
41.	Richardson mine	Au
42.	Rooks mine	fl
43.	Sager, Earl	st (white rhyolite)
44.	St.Charles mine	Fe
45.	Sexsmith mine	Fe
46.	Seymour mine (Mrs. Lura E. Baalim)	Fe
47.	Sophia mine (Earl Sager)	Au
48.	South Reynolds mine	fl
49.	Stewart mine	Fe
50.	Stoklosar Marble Quarries	mb
51.	Wallbridge mine	Fe
52.	Wallbridge mine	fl
53.	Wright mine (Mrs. A. Symon)	fl

MINERAL OCCURRENCES REFERENCE

Au.....Gold	mb.....Marble
ba.....Barite	Pb.....Lead
Cu.....Copper	st.....Stone
Fe.....Iron	talc.....Talc
fl.....Fluorite	

SOURCES OF INFORMATION

Geology by D.F. Hewitt, 1964, E.C. Appleyard and G.R. Guillet, 1966, with additional information from maps by M.E. Wilson, A.K. Sahs, and Ian Bain.
Base map from Ontario Department of Lands and Forests, Forest Resources Inventory maps, and uncontrolled mosaics.

Issued 1966.

ODM4160

ONTARIO DEPARTMENT OF MINES

PRELIMINARY GEOLOGICAL MAP No. P.369

MADOC TOWNSHIP (South Part) and HUNTINGDON TOWNSHIP (North Part)

HASTINGS COUNTY

Scale 1 inch to ½ mile

N.T.S. Reference 31C/12E, 31C/11W, 31C/5E, 31C/6W
G.S.C. Aeromagnetic Maps 14G, 95G, 13G

LEGEND FOR P.368 AND P.369

PALEOZOIC

	11	Black River limestone.

PRECAMBRIAN

Plutonic Rocks

10	10	Diabase
9	9	Granite and syenite undifferentiated
	9G	Granite
	9Sy	Syenite
8	8	Migmatite
7	7	Grey granodiorite
6	6	Diorite and gabbro undifferentiated
	6a	Diorite
	6b	Gabbro

Metasediments and Metavolcanics

Metasediments

5	5	Quartzite and quartzo-feldspathic rocks
	5Q	Quartzite
	5F	Felsite
4	4	Pelitic rocks
	4a	Argillite, greywacke
	4P	Paragneiss
	4s	Schist
	4cg	Conglomerate
3	3	Marble undifferentiated
	3d	Dolomitic marble
	3L	Calcitic marble
	3s	Lime silicate rock
2	2A	Para-amphibolite
	2Ag	Garnet amphibolite

Metavolcanics

Basic Metavolcanics

1	1a	Amphibolite, amphibolite schist
	1b	Massive andesite
	1Agg	Agglomerate
	1c	Tuff
	1Pl	Pillow lava

Acid Metavolcanics

1R	Rhyolite
1Rt	Rhyolite tuff
1F	Felsite
1Rbx	Rhyolite breccia
bx	Breccia

GEOLOGICAL AND MINING SYMBOLS

- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, top unknown; (inclined, vertical).
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (horizontal, inclined, vertical).
- Gneissosity, (horizontal, inclined, vertical).
- Lineation with plunge.
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Fault; (observed, assumed).
- Shaft; depth in feet.
- Quarry.

LIST OF PROPERTIES, MINES AND MINERAL OCCURRENCES

1.	Bailey mine (Mrs. S.D. Vale)	fl
2.	Bannockburn mine	Au
3.	Bannockburn pyrite mine	py
4.	Blakely fluorspar mine (Stoklosar Marble Quarries)	fl
5.	Blakely pyrite mine (Earl Sager)	py
6.	Brennan mine	Fe
7.	Cameron mine	Fe
8.	Canada Talc Industries Ltd.	talc
9.	Canadian Sulphur Ore Company (Earl Sager)	py
10.	Cook mine	Fe
11.	Dufferin mine (Bruce C. Robson)	Fe
12.	Eldorado copper mine	Cu
13.	Eldorado talc mine	talc
14.	Forty-nine acre mine (Bruce C. Robson)	Fe
15.	Grenville Aggregate Specialties Ltd.	mb
16.	Herrington mine	fl
17.	Hill mine	fl
18.	Hollandia mine	Pb
19.	Howard (Hill) mine	fl
	Huntingdon Fluorspar Mines Ltd.	fl
20.	Coe mine	
21.	Johnston mine	
22.	Kilpatrick mine (Detomac)	
23.	McIlroy mine	
24.	Noyes mine	
25.	Perry mine	
26.	Perry Lake mine	
27.	Rogers mine	
28.	Jones mine	fl
29.	Keene mine	fl
30.	Lee Junior mine (Philip Morris)	fl
31.	Lee Senior mine	fl
32.	McBeath mine	fl
33.	Miller mine	fl
34.	Minnesota Minerals Ltd.	st
35.	Minnesota Minerals Ltd.	st (red granite)
36.	Palmateer mine	fl
37.	Ponton mine	fl
38.	Reynolds mine (Mrs. A. Symon)	fl
39.	Reynolds North mine	fl
40.	Reynolds South mine	fl
41.	Richardson mine	Au
42.	Rooks mine	fl
43.	Sager, Earl	st (white rhyolite)
44.	St Charles mine	Fe
45.	Sexsmith mine	Fe
46.	Seymour mine (Mrs. Lura E. Baalim)	Fe
47.	Sophia mine (Earl Sager)	Au
48.	South Reynolds mine	fl
49.	Stewart mine	Fe
50.	Stoklosar Marble Quarries	mb
51.	Wallbridge mine	Fe
52.	Wallbridge mine	fl
53.	Wright mine (Mrs. A. Symon)	fl

MINERAL OCCURRENCES REFERENCE

Au.....Gold	mb.....Marble
ba.....Barite	Pb.....Lead
Cu.....Copper	st.....Stone
Fe.....Iron	talc.....Talc
fl.....Fluorite	

SOURCES OF INFORMATION

Geology by D.F. Hewitt, 1964, E.C. Appleyard and G.R. Guillet, 1966, with additional information from maps by M.E. Wilson, A.R. Saha, and Ian Bain.

Base map from Ontario Department of Lands and Forests, Forest Resources Inventory maps, and uncontrolled mosaics.

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